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MEMORANDUM FOR PR (In-House Publication)

FROM: PROI (TI) (STINFO)

15 May 2000

SUBJECT: Authorization for Release of Technical Information, Control Number: AFRL-PR-ED-TP-2000-116

Liu, C.T., Miller, T.C., "Effect of Crack Size on Initiation and Growth Behavior in a Particulate Composite Material"

SEMIX International Congress on Experimental Mechanics (Orlando, FL, 05-08 Jun 2000) (Submission Deadline: 31 May 00) (Statement A)

This request has been reviewed by the Forb.) military/national critical technology, c.) ed.) appropriateness for release to a foreign national comments:	xport controls or distribution restrictions, ation, and e.) technical sensitivity and/or economic at the control of the contro	nomic sensitivity.
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	ROBERT C. CORLEY	(Date)

Senior Scientist (Propulsion) Propulsion Directorate



Initiation and Propagation Behavior in a Particulate Composite Material Effect of Crack Size on Growth

C.T. Liu

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T.C. Miller

Air Force Research Laboratory

AFRL/PRSM

Edwards AFB, CA 93524-7680

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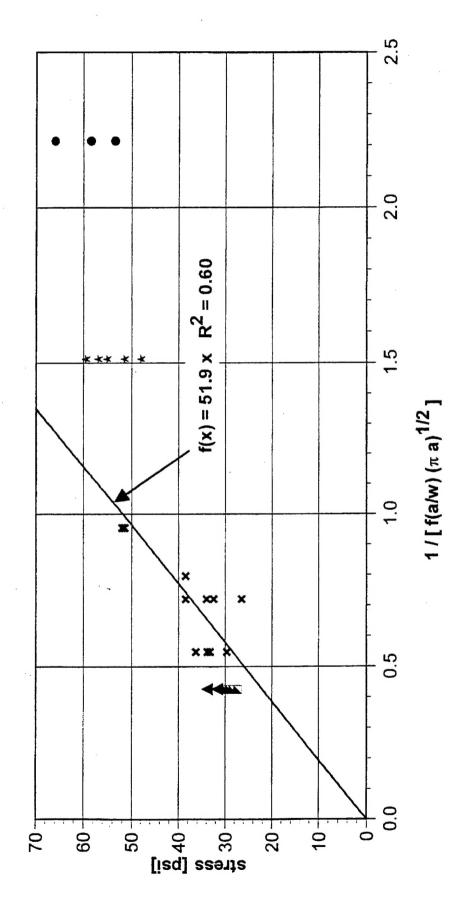
Objectives

Initial Crack Length on the Crack Growth Behavior in Investigate the Effects of Specimen Thickness and a Particulate Composite Material. Specimen Thickness: 0.2 in., 0.5 in., 1.0 in., and 1.5 in.

Initial Crack length: 0.1 in. and 0.3 in.



Initiation Stress Intensity Factor **Determination of the Critical**



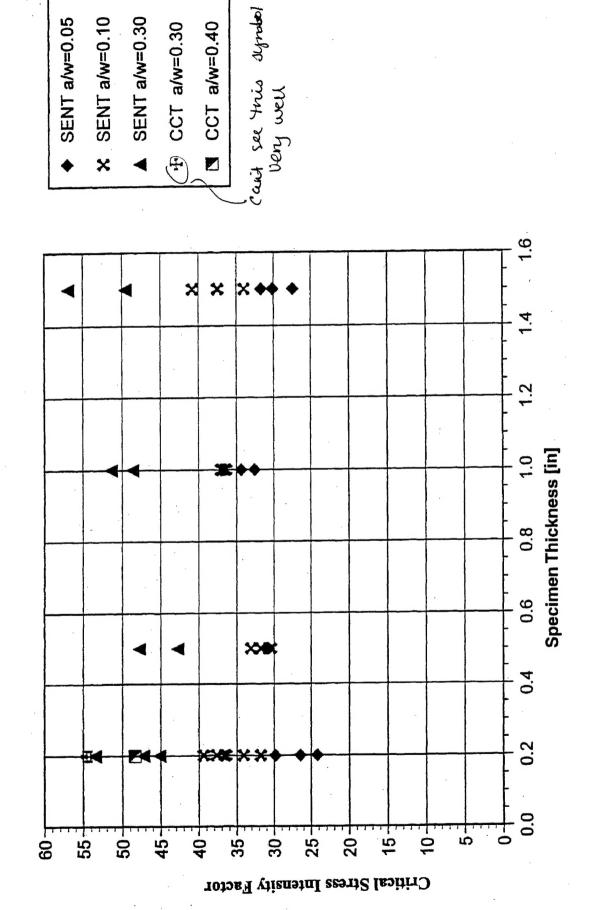
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combined data

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Critical Initiation Stress Intensity Factor Vs. Specimen Thickness



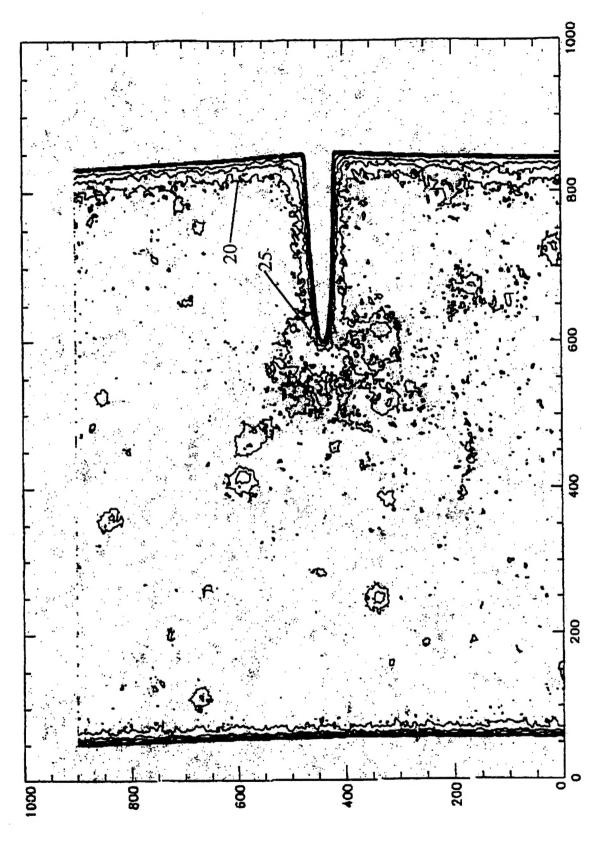


Iso-Intensity Contour Plot of the X-Ray Energy Transmitted through the Specimen (Prior to Growth)

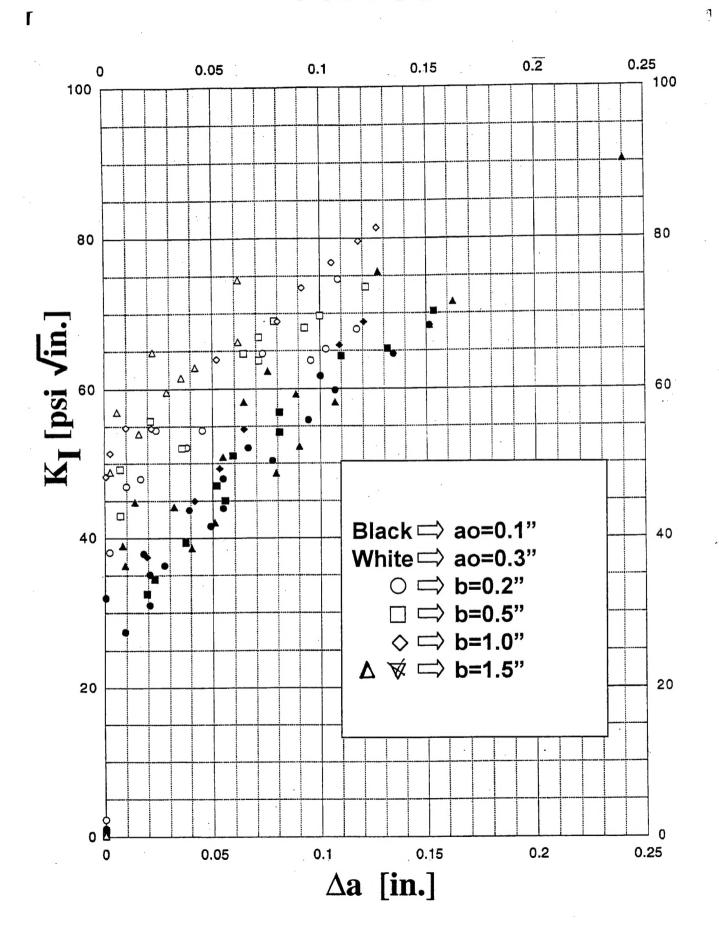


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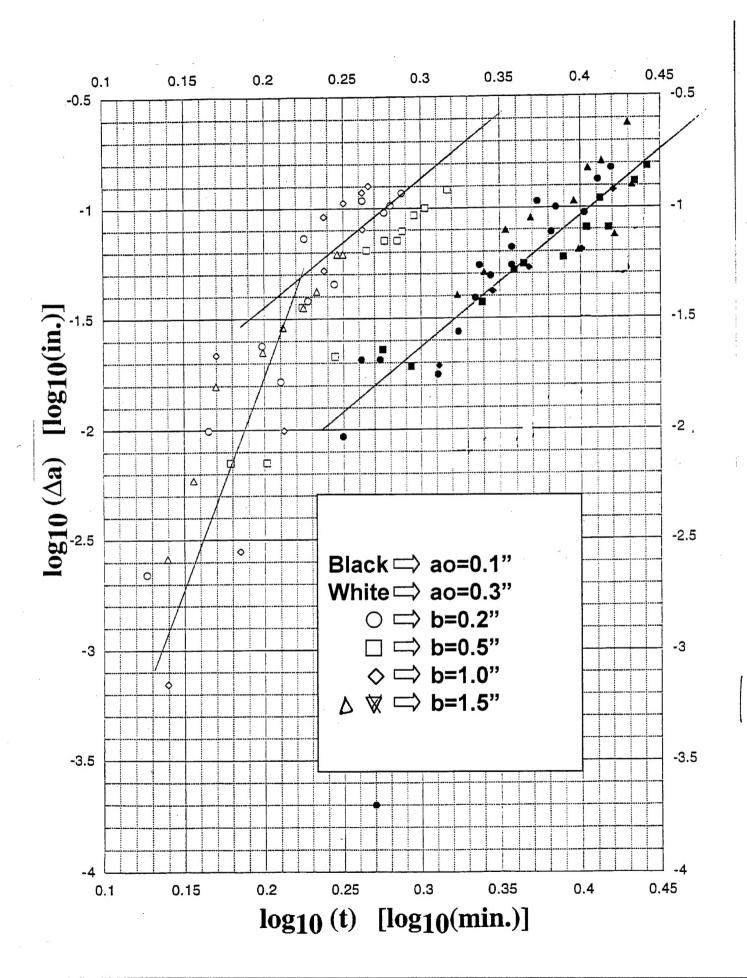
Iso-Intensity Contour Plot of the X-Ray Energy Transmitted through the Specimen (After Growth)



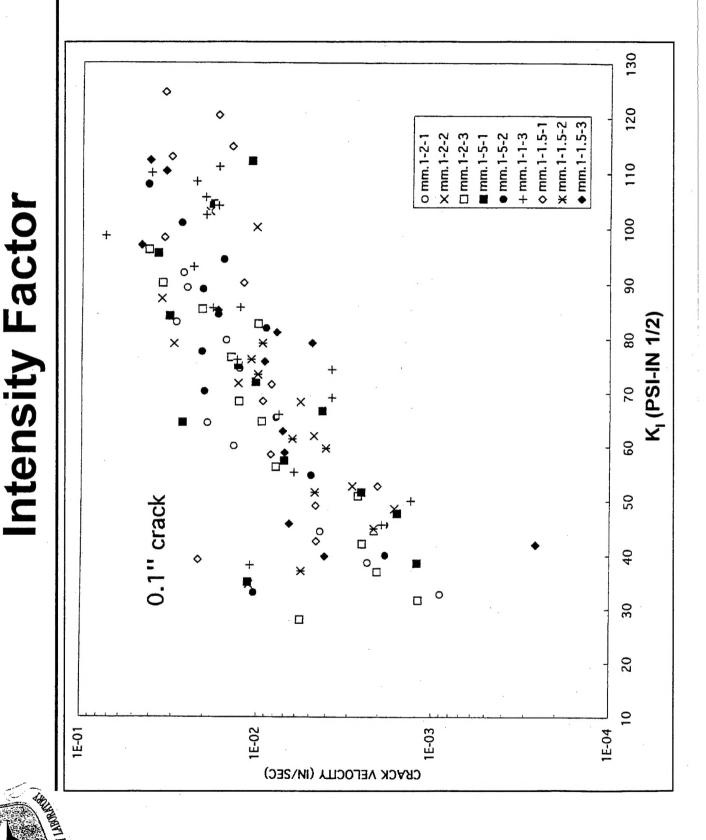
Crack Growth Resistance Curves



Crack Growth Curves

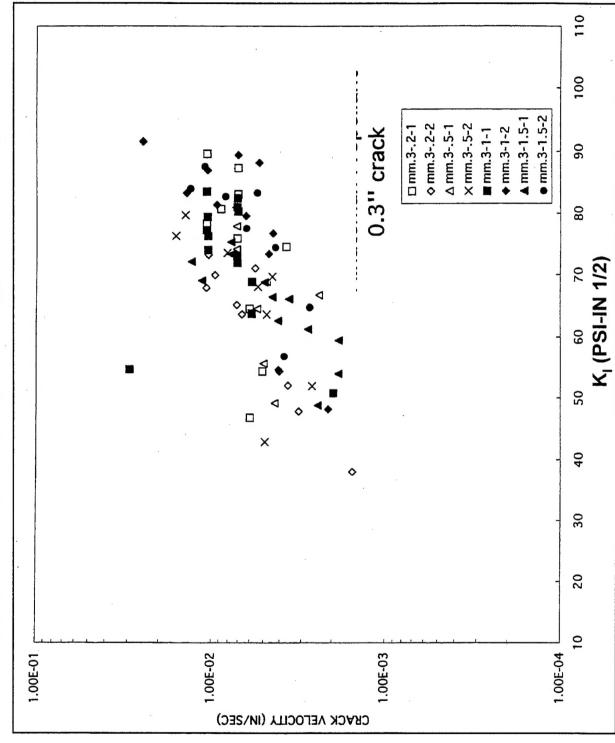


Crack Growth Rate Vs. Stress

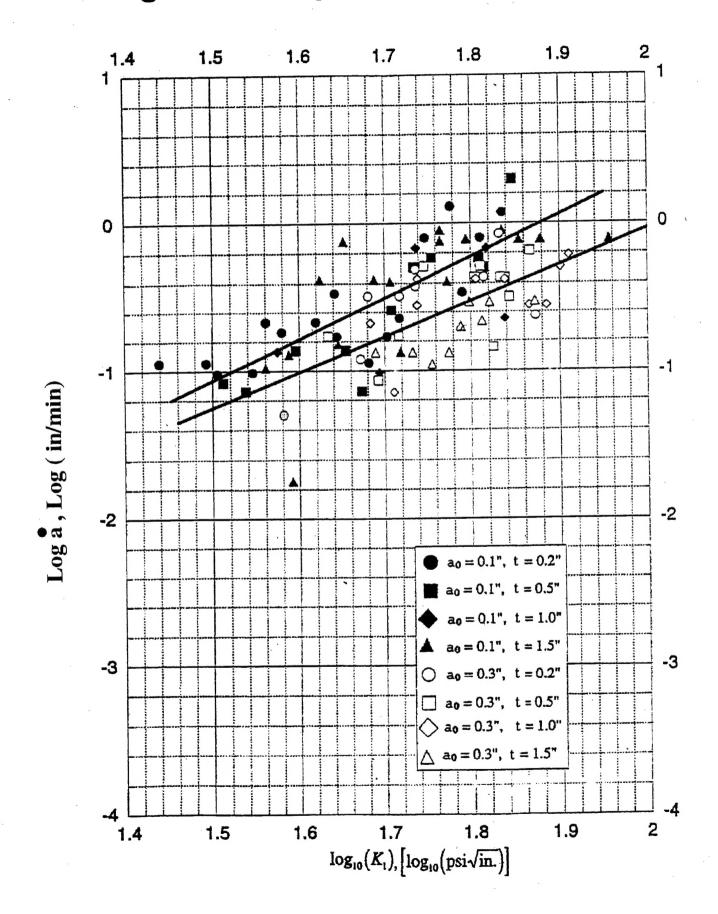




Crack Growth Rate Vs. Stress Intensity Factor



Crack Growth Rate Vs. Mode I Stress Intensity Factor for Different Initial Crack Lengths and Specimen Thickness





Conclusions

- The Initiation Mode I Stress Intensity Factor Kici and the Crack Growth Behavior Is Insensitive to the Specimen Thickness.
- Classical Linear Fracture Mechanics Can Not Be Used to Determine K_{ICI} for Initial Crack Length Equal to or Less Than 0.1 Inches.
- Initial Crack Length Has No Significant Effect on the Crack Growth Behavior.
- There Is No Plan Strain Fracture Toughness of This Particulate Composite Material.